

What is claimed is:

1. A method of controlling gene expression in a plant comprising:
- 5 a) transforming said plant with a first receptor expression cassette which encodes a first receptor polypeptide comprising a first ligand binding domain, a second receptor expression cassette which encodes a second receptor polypeptide comprising a second ligand binding domain, wherein said first and second receptor polypeptides are mutually distinct, and a target expression cassette encoding a target polypeptide;
- 10 b) expressing said first and second receptor polypeptides in said transformed plant; and
- 15 c) contacting said transformed plant with one or more chemical ligands which are complementary to the ligand binding domain of said first or second receptor polypeptides whereby said receptor polypeptides in the presence of said chemical ligand activate the expression of said target polypeptide.
2. The method of claim 1 wherein said first and second receptor polypeptides are members of the Class II steroid and thyroid hormone superfamily of nuclear receptors.
- 20 3. The method of claim 2 wherein said first receptor polypeptide is Ecdysone Receptor.
4. The method of claim 3 wherein said first receptor polypeptide further comprises a heterologous transactivation domain.
- 25 5. The method of claim 4 wherein said heterologous transactivation domain is the transactivation domain from the C1 regulatory gene of maize.
6. The method of claim 3 wherein said first receptor polypeptide further comprises a heterologous DNA binding domain.
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7. The method of claim 6 wherein said DNA binding domain is the DNA binding domain from the GAL4 protein of yeast.

8. The method of claim 2 wherein said second receptor polypeptide is USP.

9. The method of claim 3 wherein said second receptor polypeptide further comprises a heterologous transactivation domain.

10. The method of claim 9 wherein said heterologous transactivation domain is the transactivation domain from the VP16 protein of herpes simplex.

11. The method of claim 1 wherein said first or second receptor polypeptide has been mutated in the ligand binding domain.

12. The method of claim 1 wherein said chemical ligand is an insect hormone, an insect hormone antagonist or an insect hormone agonist.

13. The method of claim 12 wherein said chemical ligand is fenoxycarb, CGA 59,205, MIMIC® or RH 5849.

14. The method of claim 1 wherein said target expression cassette comprises a 5' regulatory region further comprising between 1 and 11 copies of a response element.

15. A method of controlling the fertility of a plant comprising:

- a) transforming said plant with a first receptor expression cassette which encodes a first receptor polypeptide comprising a first ligand binding domain, a second receptor expression cassette which encodes a second receptor polypeptide comprising a second ligand binding domain, wherein said first and second receptor polypeptides are mutually distinct, and a target expression cassette encoding a target polypeptide;

b) expressing said first and second receptor polypeptides in said transformed plant;
and

c) contacting said transformed plant with one or more chemical ligands which are complementary to the ligand binding domain of said first or second receptor polypeptides whereby said receptor polypeptides in the presence of said chemical ligand activate the expression of said target polypeptide, wherein said target polypeptide renders fertilization ineffective or restores effective fertilization.

16. The method of claim 15 wherein said receptor expression cassette comprises an anther-specific promoter operably linked to the coding sequence for said receptor polypeptide.

17. The method of claim 15 wherein said receptor expression cassette comprises a pistil-specific promoter operably linked to the coding sequence for said receptor polypeptide.

18. The method of claim 15 wherein said target polypeptide renders fertilization ineffective.

19. The method of claim 18 wherein said target polypeptide is the ribonuclease barnase.

20. The method of claim 15 wherein said target expression cassette encodes the anti-sense version of a coding sequence critical to effective fertilization, thereby rendering fertilization ineffective.

21. The method of claim 15 wherein said target polypeptide restores effective fertilization.

22. The method of claim 21 wherein said target polypeptide is the ribonuclease inhibitor barstar.

23. A transgenic plant comprising:

- a) a first receptor expression cassette which encodes a first receptor polypeptide;
- b) a second receptor expression cassette encoding a second receptor polypeptide; and
- c) a target expression cassette encoding a target polypeptide.

24. The plant of claim 23 wherein said plant is maize.

25. The plant of claim 23 wherein said plant is wheat.

26. A receptor expression cassette comprising:

- a) a 5' regulatory region capable of promoting expression in a plant cell;
- b) an operably linked coding sequence encoding a receptor polypeptide comprising a ligand binding domain; and
- c) a 3' terminating sequence.

27. The receptor expression cassette of claim 26 wherein said receptor polypeptide is a member of the Class II steroid and thyroid hormone superfamily of nuclear receptors.

28. The receptor expression cassette of claim 27 wherein said receptor polypeptide is Ecdysone Receptor.

29. The receptor expression cassette of claim 28 wherein said receptor polypeptide further comprises a heterologous transactivation domain.

30. The receptor expression cassette of claim 29 wherein said heterologous transactivation domain is the transactivation domain from the C1 regulatory gene of maize.

31. The receptor expression cassette of claim 28 wherein said receptor polypeptide further comprises a heterologous DNA binding domain.

32. ~~The receptor expression cassette of claim 31 wherein said heterologous DNA binding domain is the DNA binding domain from the GAL4 of yeast.~~

33. The receptor expression cassette of claim 26 wherein said receptor polypeptide is USP.

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34. The receptor expression cassette of claim 33 wherein said receptor polypeptide further comprises a heterologous transactivation domain.

35. The receptor expression cassette of claim 34 wherein said heterologous transactivation domain is the transactivation domain from the VP16 protein of herpes simplex.

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36. ~~The receptor expression cassette of claim 26 wherein said receptor polypeptide has been mutated in the ligand binding domain.~~

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